CLAIMS:

1. A wireless communication device comprising:

a constellation selector that adaptively selects a signal constellation from a set of constellations based on channel state information for a wireless communication channel, wherein the constellation selector maps information bits of an outbound data stream to symbols drawn from the selected constellation to produce a stream of symbols;

a beamformer that generates a plurality of coded data streams from the stream of symbols; and

a plurality of transmit antennas that output waveforms in accordance with the plurality of coded data streams.

2. The wireless communication device of claim 1, wherein the constellation selector selects the signal constellation based at least in part on partial information for the wireless communication channel.

3. The wireless communication device of claim 1, wherein the constellation selector selects the signal constellation based at least in part on channel mean feedback received from a second wireless communication device.

4. The wireless communication device of claim 1, wherein the constellation selector selects the signal constellation based at least in part on a target throughput.

5. The wireless communication device of claim 1, wherein the beamformer comprises a space-time block coder that processes the stream of symbols from the constellation selector to generate space-time block coded data streams.

6. The wireless communication device of claim 5, wherein the space-time block coder processes the stream of symbols to generate N space-time block coded data streams, where N equals the number of transmit antennas.

7. The wireless communication device of claim 5, wherein the beamformer comprises a power splitter that controls a total power allocated across the space-time block coded data streams.

8. The wireless communication device of claim 7, wherein the power splitter adjusts the power allocated to the space-time block coded streams based at least in part on the channel information.

9. The wireless communication device of claim 7, wherein the power splitter adaptively adjusts allocation of total power across the space-time coded data streams as a function of the constellation that is selected by the constellation selector.

10. The wireless communication device of claim 1, wherein the power splitter adjusts a power allocation of the data streams to maximize the transmission rate while maintaining a target bit error rate.

11. The wireless communication device of claim 1, wherein the beamformer applies an antenna weighting vector to the space-time coded data streams to allocate a portion of each of the space-time coded data streams to each of the output antennas.

12. The wireless communication device of claim 11, wherein the beamformer adaptively adjusts the antenna weighting vector based on the channel state information.

13. The wireless communication device of claim 12, wherein the antenna weighting vector comprises an eigen vector of a correlation matrix representative of the channel state information.

14. The wireless communication device of claim 1, wherein the beamformer is a two-dimensional beamformer that generates the plurality of coded data streams as two orthogonal data streams.

15. The wireless communication device of claim 1, wherein the wireless communication device comprises a mobile phone.

16. The wireless communication device of claim 1, wherein the wireless communication device comprises a base station.

17. A wireless communication device comprising:

a plurality of adaptive modulators to process respective streams of information bits, wherein each adaptive modulators comprises:

(i) a constellation selector that adaptively selects a signal constellation from a set of constellations based on channel state information for a wireless communication channel, wherein the constellation selector maps the respective information bits to symbols drawn from the selected constellation to produce a stream of symbols; and

(ii) a beamformer that generates a plurality of coded data streams from the stream of symbols; and

a modulator to produce a multi-carrier output waveform in accordance with the plurality of coded data streams for transmission through the wireless communication channel.

18. The wireless communication device of claim 17, further comprising a plurality of transmit antennas that output the multi-carrier waveform.

19. The wireless communication device of claim 17, wherein each adaptive modulator further comprises:

a power loader that processes the respective stream of information bits and loads additional information bits indicative of a power allocated to the respective stream of information bits,

wherein the respective constellation selector adaptively selects the signal constellation based on based on the additional information bits.

20. The wireless communication device of claim 19, wherein the power loader of the adaptive modulators loads the additional information bits based on the channel state information.

21. The wireless communication device of claim 17, wherein the constellation selectors of the adaptive modulators load additional information bits within the streams of information bits to indicate the selected constellations.

22. The wireless communication device of claim 21, wherein the constellation selectors of the adaptive modulators insert the additional bits by determining which of the streams of information bits are able to support each of the additional bits with the least required additional power.

23. The wireless communication device of claim 17, wherein the adaptive modulators jointly perform power and bit loading across the streams of information bits.

24. The wireless communication device of claim 17, wherein the constellation selectors of the adaptive modulators select the signal constellation for the respective stream of information bits based on partial information for the wireless communication channel.

25. The wireless communication device of claim 17, wherein the beamformer of each of the adaptive modulators comprise a space-time block coder that processes the respective stream of symbols from the constellation selector to generate space-time block coded data streams.

26. The wireless communication device of claim 25, wherein the beamformer of each of the adaptive modulators comprises a power splitter that controls a total power allocated across the space-time block coded data streams based on the channel information.

27. The wireless communication device of claim 25, wherein the beamformer of each of the adaptive modulators that applies an antenna weighting vector to the space-time coded data streams based on the channel state information to allocate a portion of each of the space-time coded data streams to each of the output antennas.

28. The wireless communication device of claim 17, wherein the wireless communication device comprises a mobile phone.

29. The wireless communication device of claim 17, wherein the wireless communication device comprises a base station

30. A method comprising:

receiving channel state information for a wireless communication system;

adaptively selecting a signal constellation from a set of constellations based on the channel state information; and

coding signals for transmission by a multiple antenna transmitter based on the estimated channel information and the selected constellation.

31. The method of claim 30, further comprising

mapping information bits of an outbound data stream to symbols drawn from the selected constellation to produce a stream of symbols;

generating a plurality of coded data streams from the stream of symbols to produce a plurality of coded signals; and

outputting waveforms from a plurality of transmit antennas in accordance with the plurality of coded data streams.

32. The method of claim 31, wherein adaptively selecting a signal constellation comprises adaptively selecting the signal constellation based at least in part on channel mean feedback received from a second wireless communication device.

33. The method of claim 30, wherein coding signals comprises forming Eigen-beams based on the channel state information.

34. The method of claim 30, wherein coding signals comprises processing the stream of symbols from the constellation selector to generate space-time block coded data streams.

35. The method of claim 34, further comprising applying a power splitter to controls a total power allocated across the space-time block coded data streams.

36. The method of claim 35, further comprising adjusting the power allocated to the space-time block coded streams based at least in part on the channel information.

37. The method of claim 35, further comprising adaptively adjusting allocation of total power across the space-time coded data streams as a function of the constellation that is selected by the constellation selector.

38. The method of claim 35, further comprising applying an antenna weighting vector to the space-time coded data streams to allocate a portion of each of the space-time coded data streams to each of the multiple antennas.

39. The method of claim 38, further comprising adjusting the antenna weighting vector based on the channel state information.

40. The method of claim 30, further comprising:

adaptively selecting a signal constellation from a set of constellations for each sub-carrier of a multi-carrier wireless communication system;

generating an outbound streams for each sub-carrier based on the selected constellations;

applying an eigen-beamformer to each of the streams of symbols to generate a plurality of coded data streams; and

applying modulators to produce a multi-carrier output waveform in accordance with the plurality of coded data streams for transmission through the multi-carrier wireless communication channel.

41. The method of claim 40, further comprising adaptively selecting a signal constellation for each subcarrier based on the power allocated to each subcarrier.

42. A computer-readable medium comprising instructions for causing a programmable processor of a wireless communication device to:

receive channel state information for a wireless communication system;

select a signal constellation from a set of constellations based on the channel state information;

map information bits of an outbound data stream to symbols drawn from the selected constellation to produce a stream of symbols; and

apply an eigen-beamformer to generate a plurality of coded data streams from the stream of symbols to produce a plurality of coded signals.